APPENDIX C

RADIATION SAFETY TRAINING PROGRAM

I. Introduction

A. General

Industrial radiography using radioactive material shall only be performed by or under the personal supervision of trained, certified, and licensed radiographic personnel. Personnel training in radiation safety, along with strict adherence to approved operating and emergency procedures are the principal means of insuring safe radiographic operations. Radiographic personnel include the following defined positions:

1. Radiographer:

Any individual who performs or who, in attendance at the site where sources of radioactive material are being used, personally supervises industrial radiographic operations and who is responsible to the licensee for assuring compliance with the requirements of the regulations and the conditions of the license. **Only personnel who have been certified through a radiographer certification program may serve as a Radiographer in the State of Arkansas.**

2. Radiographer Instructor:

Any radiographer who has been listed on a specific license from the Department and meeting specific requirements or the Rules and Regulations.

3. Radiographer's Assistant:

Any individual who, under the direct supervision of a radiographer, uses radiographic exposure devices, sealed sources or related handling tools, or radiation survey instrumentation in industrial radiography.

There are three training requirements associated with industrial radiography. Radiographic Personnel Training will be provided to the above-defined workers who will be using the radiographic devices. Hazardous Materials (Hazmat) Employee Training will be provided to any worker associated with the packaging and transportation of radioactive material. Ancillary Personnel Radiation Awareness Training will be provided to all personnel who may be in the vicinity of the radiographic devices (for example, vicinity of device permanent storage area) during their routine work activities. The training will be conducted at the frequency specified in the following table:

Training Requirement	Frequency of Training
Radiographic Personnel Training	Initial; Annual Refresher
Hazardous Materials (Hazmat) Training	Initial; Refresher every 3 years
Ancillary Personnel Radiation Awareness Training	Initial; Annual Refresher

B. Radiographic Personnel

1. The Rules and Regulations establish requirements for the Radiographer's and Radiographer's Assistant's training program. The training programs for each of these positions must be described in the application. The description must include training procedures, as well as a detailed training outline and a sequence of events (timeline) from the time of hiring an individual through the designation of the individual as a Radiographer's Assistant and, finally, as a certified Radiographer. Similarly, a program description, including procedures, for training experienced radiographic personnel must also be submitted. Experienced Radiographers who have worked for another licensee **must** receive formal training by the new employer similar to that given to Radiographer's Assistant's candidates.

2. The training program for Radiographers and Radiographer's Assistant shall include the following components:

   a. Initial training.

   b. On-the-job training

   c. Periodic (refresher) training.

   d. Assessment of the Radiographer's and Radiographer's Assistant's knowledge of and ability to comply with regulatory requirements, and the operating and emergency procedures.

   e. Period internal inspection of the Radiographer's and Radiographer's Assistant's job performance during actual industrial radiography operations.

3. The radiographic personnel training program has four requirements:

   a. "Instructions to Radiation Workers", includes general radiation awareness training for all personnel.

   b. Training in operating and emergency procedures and equipment to qualify as a Radiographer' Assistants

   c On-the-job training.

   d. Radiation safety training (minimum 40 hours), combined with two (2) months of on-the-job training, to qualify as a radiographer.

4. Three of the training requirements (Items a, b, and c) must be addressed during the initial training to qualify as a Radiographer's Assistant. The radiation safety training and on-the-job training must be accomplished to qualify as a Radiographer and the radiographer certification examination. The Hazardous Materials Training, required by the U.S. Department of Transportation, must also be provided during the initial training program.

5. This Appendix describes the overall training and qualification program that is required by the Department.

II. Generic Training Program Components

A. Radiographer Instructor

Individuals serving as Radiographer Instructors for radiation safety training of radiographic personnel shall have the following minimum qualifications:

1. One year of documented industrial radiography experience as a Radiographer; and,
2. At least 16 hours of formal instruction in the establishment and maintenance of a radiation protection program, including training to perform internal inspections and mitigation of radiological accidents.

B. Training and Testing Format

Training is conducted in a formal classroom setting, except for practical training/testing on equipment use, which is conducted during special training sessions, not during production radiography.

Examinations on radiography training topics shall be closed book. Written tests shall be taken without assistance, under the Radiographer Instructor's supervision. The minimum passing score is 80% on all examinations. Individuals who fail to obtain a passing score shall be provided additional training. The duration of the training and the time interval before the individual is allowed to re-take the examination is left to the discretion of the Radiographer Instructor. New examinations with different questions covering the same topics are used for re-testing. A copy of a typical examination and the correct answers to the examination questions shall be provided to the Department.

Practical examination questions shall be written and the examination shall be administered by the Radiographer Instructor. The practical examination shall be taken without assistance. The minimum passing score is 80% on all examinations. Attachment C-1 contains a checklist that may be used as a source of potential examination questions and areas of evaluation for the practical examination. A copy of a typical practical examination and the correct responses to the examination questions shall be provided to the Department

III. Radiation Workers Awareness Training

A. Prior to handling, transporting, or operating radiographic devices, all radiographic personnel will receive the general radiation safety training as required by Paragraph RH-2803, "Instructions to Workers", of the Rules and Regulations for Control of Sources of Ionizing Radiation. The following instructions will be provided:

1. Information on the storage, security, transfer, or use of radiographic devices at permanent facilities and temporary job sites
2. The health effects associated with exposure to radiation or radioactive material
3. Precautions and procedures used to minimize exposures
4. Applicable provisions of Arkansas' radiation control regulations and the company's Radioactive Materials License
5. Workers' responsibility to report any unsafe conditions in the workplace
6. Appropriate responses to warnings made in the event of incidents having the potential to involve radiation exposure
7. Reporting requirements for occupational radiation exposures described in Paragraph RH-2804, "Notifications and Reports to Individuals".

B. Radiation awareness training is usually provided concurrently with other radiation safety training as part of the Radiographer's Assistant training program. When this radiation awareness portion of the training is offered on a stand-alone format, it will typically last 2 - 4 hours. The duration may vary based on attendees' comprehension of the topics covered. A question and answer session will be held at the end of the training period, and attendees will be encouraged to request clarification as necessary during the presentation.

IV. Hazmat Employee Training

A. Radioactive material contained in radiographic devices is classified as hazardous material by the U.S. Department of Transportation (DOT). In accordance with DOT regulations (49 CFR Part 172, Subpart H) workers must complete hazmat training prior to performing work that directly affects hazardous material transportation safety. (Exception: New driver employees can transport for 90 days without the training, provided a hazmat-trained employee directly supervises them.) Refresher training must be provided at least once every 3 years.

B. Hazmat training will include the following: general awareness/familiarization, function specific, and safety training. It will be provided either in-house or by qualified third party trainers. **Completion of the radiographic personnel training can satisfy the hazmat training requirement; however, additional documentation is required (see below).**

C. Documentation of hazmat training will be maintained for the duration of each worker's employment, plus 90 days, and will include the following information:

1. The employee's name and date of most recent training completed;
2. Description, copy or location of training materials used;
3. Name and address of the person providing the training; and

4. Certification that the employee has been trained and tested as required.

D. Driver training meeting the requirements of 49 CFR 177.816 must be provided to all personnel driving vehicles containing radiographic devices, and may be provided concurrently with hazmat employee training.

IV. Radiographer's Assistant Training

A. In order to qualify as a Radiographer's Assistant, an individual must satisfactorily complete a training and qualification program. The training shall consist of at least 16 hours of initial formal classroom training which must include the following subjects:

1. Radiation awareness (2-4 hours)
2. Hazmat employee (2-4 hours)
3. Licensee's operating and emergency procedures (4-6 hours)
4 Regulatory requirements of the Rules and Regulations and the Radioactive Material License. (1-2 hours)

The Radiographer's Assistant training involves overlapping training requirements (specifically, radiation awareness and hazmat) and this training may be provided concurrently.

B. The individual must also receive training (4-6 hours) and develop competence in using the radiographic devices and associated equipment, and radiation survey instruments that will be used during industrial radiography. This "hands-on" training and equipment use must be under the direct personal supervision of a Radiographer or Radiographer Instructor.

C. As the final qualification for Radiographer's Assistant, the individual must

1. Demonstrate an understanding of the instructions described in Paragraph IV.A, above, by successfully completing ($\geq$ 80%) a written examination (minimum 25 questions) on the subjects, and,
2. Demonstrate competence in the use of radiographic devices and radiation survey instruments by successfully completing ($\geq$ 80%) a practical examination using the equipment.

The examinations shall be administered by a Radiographer Instructor.

V. Radiographer Training

A. In order to qualify as a Radiographer, an individual must satisfactorily complete a training and qualification program. The training shall consist of at least 40 hours of training and must include topics listed in the Rules and Regulations, Paragraph RH-1804, "Subjects to be Covered During the Instruction of Radiographers", specifically, the following:

1. Fundamentals of Radiation Safety
2. Radiation Detection Instruments

3. Radiographic Equipment to be Used

4 Regulatory Requirements of the Rules and Regulations and the Radioactive Material License

5. Licensee's Written Operating and Emergency Procedures

6. Case Histories of Accidents in Radiography

B. Following the training, the individual must

1. Demonstrate an understanding of the instructions described in Paragraph V.A, above, by successfully completing (≥80%) a written examination (minimum 50 questions) on the subjects, and,

2. Demonstrate competence in the use of radiographic devices and radiation survey instruments by successfully completing (≥80%) a practical examination using the equipment.

The examinations shall be administered by a Radiographer Instructor.

C. Additionally, the individual must document a minimum of two months (320 hours) of on-the-job training (OJT) as a Radiographer's Assistant.

D. The Licensee shall furnish the following documents to the individual prior to the beginning of the Radiographer's training program:

1. Arkansas Rules and Regulations for Control of Sources of Ionizing Radiation

2. Arkansas Radioactive Material License

3. Operating and Emergency Procedures

VI. Radiographer Certification

A. General Information

1. The Arkansas Rules and Regulations for Control of Sources of Ionizing Radiation, Paragraph RH-1802.b.1.A, "Training" requires that an individual be "…certified through a radiographer certification program by a certifying entity…" before acting as a Radiographer performing industrial radiography. The American Society for Nondestructive Testing (ASNT) and some state radiation control agencies are approved certifying entities.

2. Certification requires the individual to submit documentation demonstrating completion of OJT hours, completion of a practical exam, and obtaining a passing score on a certification exam. Certification is valid for 5 years, unless suspended or revoked prior to expiration, and re-testing is required for renewal.

B. ASNT Radiographer Certification **DOES NOT ADDRESS X-RAY**

1. The ASNT is recognized by both the U.S. Nuclear Regulatory Commission and the Conference of Radiation Control Program Directors, Inc. (CRCPD) as an independent certifying organization, approved for radiographer certification through its Industrial Radiographer Radiation Safety Personnel (IRRSP) program.

2. The examination consists of 125 questions and must be completed within 3 hours. Examination schedules may be accessed at www.asnt.org and special examination dates can be arranged. Certification program documents, including the application, outline of exam subjects, and a list of reference materials are available on the ASNT website. Examination results are mailed within 2-4 weeks after the test, and a certification wallet card is mailed to successful candidates. The ASNT uses 10 CFR for its questions on generic regulatory requirements and radiography rules.

C. State Certification

Radiographer certification programs operated by state radiation control agencies are modeled after the Texas program (states contract with Texas to format the TX exam to fit each state's regulations). Information on state certification programs is available from the Department and the NRC.

D. Certification Records

Radiographer certification records and documentation are maintained on file with radiography training and examination records until termination of the company's license. Radiographers keep evidence of their certification (e.g., wallet card) available for inspection at temporary job sites.

VIII. Training Requirements for Experienced Personnel

If individuals with prior radiography experience are employed, these individuals shall be trained as described below.

A. Personnel with Prior Experience as a Radiographer's Assistant

Individuals with experience as a Radiographer's Assistant shall complete the same training and testing provided to individuals with no radiography experience. If an individual has documentation of radiography OJT from previous employment, the hours may be applied to the OJT requirements, provided the Radiation Safety Officer independently verifies and documents the number and quality of the hours.

The individual shall also receive radiation awareness and hazmat employee training, as described in Paragraphs III and IV, above.

B. Personnel with Prior Experience as a Radiographer

Individuals with documented experience as a radiographer will receive a minimum of 4 hours of training and examinations (written and practical exams) in Operating and Emergency Procedures and radiography equipment use to re-qualify as a Radiographer. Written examinations (~25 questions) on operating and emergency procedures will be similar to those used to test Radiographer's Assistant. Additional training may be provided if deemed necessary by the Radiation Safety Officer. If lacking documentation of radiation awareness or hazmat employee training, the individual will receive the training in accordance with this program. If documentation of radiation awareness and hazmat employee training is available and its validity has

been verified, “scaled-down” versions of the training will be provided to address company-specific subjects.

C. Verification of Prior Radiography Experience

Prior radiography experience is accepted only if the Radiation Safety Officer is able to independently verify the information. Previous employers shall be contacted and asked to provide statements (verbally or written) confirming the validity of documentation supplied by the Radiographer.

IX. Annual Refresher Training

At least 8 hours of radiation safety refresher training shall be provided to all radiographic personnel at least every 12 months. The training may be conducted in multiple sessions and may be in the form of lectures, guided discussions, demonstrations, or individualized instruction. One or more topics may be covered, such as radiation safety basics, procedures, regulatory requirements, inspection findings, equipment issues and emergency response. Examinations shall consist of written, oral or practical exams. Radiographic Instructors receive the same credit for the training as the attendees

X. Ancillary Personnel Radiation Awareness Training

A. Ancillary personnel (office personnel, janitorial personnel, non-radiation workers, etc.) who may work in the general vicinity of the radiographic devices (for example, the radiographic device permanent and temporary storage areas) shall receive radiation awareness training to insure that these individuals understand the possible hazards, safety precautions, and emergency procedures related to the use and storage of radioactive material. This training is required by the U.S. Department of Labor, Occupational Safety and Health Administration.

B. The training shall be conducted by the Radiation Safety Officer for ancillary personnel at the time of employment. Refresher training for all ancillary personnel shall be conducted at least annually thereafter.

C. The training shall last about one hour and personnel shall be encouraged to ask questions or request additional discussion of any topic covered in the training.

D. Documentation of radiation awareness training for ancillary personnel shall be maintained on file for inspection purposes.

XI. Training Records

A. Radiation Workers Awareness Training Records

Although the Arkansas Rules and Regulations do not require documentation of Radiation Workers Awareness Training, the training must be documented to demonstrate compliance.

B. Hazmat Employee Training Records

Documentation of hazmat training shall be maintained for the duration of each individual's employment, plus 90 days, and will include the following information:

1. The employee's name and date of most recent training completed;
2. Description, copy or location of training materials used;
3. Name and address of the person providing the training; and
4. Certification that the employee has been trained and tested as required by 49 CFR Part 172, Subpart H.

C. Radiation Safety Training Records

Records of initial and refresher radiation safety training and the results of qualification examinations for radiographic personnel shall be maintained on file until license termination. On-the-job training records are documented. Records of annual refresher radiation safety training are documented and maintained until license termination.

D. Records of Verification of Previous Training and Experience

Documentation of verification of previous radiography training and experience shall be retained with the rest of the worker's training, testing and certification documentation, and shall be maintained until termination of the company's license.

E. Radiographer Certification Records

Documentation of radiographer certification shall be retained in the individual's training files and maintained until termination of the company's license.

XII. Internal Performance Inspection

A. General Information

The Arkansas Rules and Regulations require the Radiation Safety Officer to inspect the job performance of each Radiographer and Radiographer's Assistant at intervals not to exceed 6 months to ensure that regulations, license requirements, and procedures are being followed. This procedure describes how the audit requirement is met.

B. Internal Inspection Procedure

Internal inspections must include observation of the performance of each Radiographer and Radiographer's Assistant during a radiographic operation. Individuals not participating in a radiographic operation for more than 6 months since the last inspection must demonstrate knowledge of Licensee's Operating and

Emergency Procedures and the safe use of radiographic and related equipment by a practical examination before participating in a radiographic operation. Inspections of the Radiation Safety Officer are not required.

The Performance Evaluation Form is used to evaluate job performance and document inspections. The Inspector must describe any deficiencies noted in the "Remarks" section.

If an inspection is performed by a designee, the Radiation Safety Officer will evaluate the designee's inspection findings within 30 days of the inspection to determine if individual's job performance exhibit diligent application of ALARA principles. The Radiation Safety Officer will sign (or initial) and date each inspection form following the review. As warranted, the Radiation Safety Officer shall take corrective action (e.g., additional training, repeat audits) to ensure that all deficiencies noted during the inspection that could result in unnecessary radiation dose are stopped and recurrence is prevented. The Radiation Safety Officer will describe on the inspection form any corrective actions taken.

C. Audit Records

Inspection records (completed Performance Evaluation Forms) shall be retained on file for a minimum 3 years beyond the date of the inspection.